Title: There's No Place Like Home…

Brief Overview:

In this learning unit, students will be instructed in the process of organizing, calculating and creating scale drawings. Once these skills are mastered, they will then be responsible for creating their own scale drawing. Students will be given a specific amount of funds with which they will have to construct a home of their own design using a variety of materials and pricing lists.

Links to NCTM 2000 Standards:

- **Mathematics as Problem Solving, Reasoning and Proof, Communication, Connections, and Representation**
  These five process standards are threads that integrate throughout the unit, although they may not be specifically addressed in the unit. They emphasize the need to help students develop the processes that are the major means for doing mathematics, thinking about mathematics, understanding mathematics, and communicating mathematics.

  Students will demonstrate their ability to solve mathematical problems by using spatial relationship skills acquired through mathematical connections. In writing detailed sales advertisements, they will be communicating mathematically. By correlating this unit to Language Arts, Technology, and Classified pages from the newspaper, students also will demonstrate their ability to make mathematical connections with other disciplines. Last of all, they will be able to create models to represent real life edifices and statistical graphs on their graphing calculators.

- **Number and Operation**
  Students will demonstrate their proficiency in solving mathematical problems involving reinforced and newly acquired understandings of ratios and proportions.

- **Patterns, Functions and Algebra**
  Students will be able to represent data in a pictograph as well as a circle graph using their graphing calculator.

- **Geometry and Spatial Sense**
  Students will be able to demonstrate their ability to construct two and three dimensional figures, further developing their sense of spatial relations by conforming to scaled parameters in their activities.

- **Measurement**
  Students will be applying techniques of measurement such as scaling, ratio, proportion, area, and perimeter.

- **Data, Statistics, and Probability**
  Students will compile data to form a qualitative survey based on the success of their project.

Links to National Science Education Standards:

- **Unifying Concepts and Processes**
  Students will link this unit to science through the use of models and measurement.

- **Physical Science**
  Students will consider the properties of the materials they choose to create their scale model.

- **Science and Technology**
  Students will be exploring technology through the use of graphing calculators.

Grade/Level:

Grade 7

Duration/Length:

This activity should take seven days including the follow-up.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Computations using addition, subtraction, multiplication and division
- Ability to use a TI-73 calculator
- Ratio and proportion
- Scale drawings and models

Student Outcomes:

Students will be able to:

- demonstrate their ability to stay within the parameters of a budget.
- create/design a scale drawing of a house using given specifications.
- construct a three-dimensional model of the designed house using a scale.
- demonstrate ability to use graphing calculator to form pictographs and circle graphs.
- communicate information mathematically.

Materials/Resources/Printed Materials:

- TI-73 calculators
- Construction paper
- Centimeter ruler
- Popsicle sticks
- Cardboard
- Graph paper
- Art supplies
- Scissors/Exacto blade
- Employment and housing classified advertisements

Development/Procedures:

Activity Launch:

- Before entering into this activity, it will be necessary for students to look at pictures of homes. Students must bring in pictures from magazines or books of houses that they find attractive .

- Students also need to gain a firm grasp of room sizes. For this activity, all measurements are in meters; so students should measure classrooms, kitchens, or the like to better grasp room sizes.

Task 1:

- Instructor presents the activity .
- Students are given Worksheet 1.
- Instructor answers questions.
- Students will create/design their own dream house. Specifications are listed on Worksheet 1.

Task 2:

- Instructor presents the advantages and disadvantages of the various building materials.
- Instructor discusses building three-dimensional models.
- Instructor provides materials for the construction of their dream house.
- Students will construct a three-dimensional model of their project. Specifications are listed on Worksheet 2.

Task 3:

- Instructor reviews the basic operational techniques of the TI-73 calculator.
- Students will tally the number of each type of house their classmates have created and graph each in a pictograph and/or a circle graph on their graphing calculator. Step-by-step instructions are found on Worksheet 3.

Task 4:

- Instructor presents the follow-up activity. During this time, the instructor will be sure that basic grammar and syntax rules are understood.
- Each pair of students will write a sales advertisement using mathematical terminology to describe their property. Instructions for this activity are located on Worksheet 4.
- Students will randomly choose an occupation from a group of classified ads supplied by either the teacher or the student. Depending on the occupation chosen, students will be allocated a specific amount of money to be spent on a house. The income that each student receives can be used during an auction, during which time students will purchase houses in which to live.

Performance Assessment:

Students will be assessed daily based on their performance. Both technological ability as well as completed tasks will be used to evaluate each student's progress. A scoring rubric for this activity is included in the attached pages.

Extension/Follow Up:

Students will be supplied real estate advertisements which they will use to locate houses matching the specifications of their own designed house. Once these advertised homes have been found, students will compare the cost of their home with the cost of the advertised home. A scatter plot can be used to represent the relationship between the two.

Authors:

Keleigh Lepson
Our Lady Queen of Peace
Baltimore County, MD

Jeffrey Zerhusen
The Park School
Baltimore County, MD

Maria Merrill
Our Lady Queen of Peace
Baltimore County, MD

Worksheet 1

Congratulations!!!!!!! You have just won the Maryland State Lottery (a one in a million chance). The prize is $200,000.00! You have decided to use this money to design and build your very own **DREAM HOUSE**!

Step 1: Drawing a scale model of your house

You are free to choose any style of home you wish. Use the examples from the class discussions to help with your decisions. You are to draw a scale model of your home using graph paper using a **scale of 1 meter of your house is 1 centimeter on your paper.**

You **must** include in your dream home at least the following:

- a scaled drawing of the floor plan of each level in your house
- a scaled drawing of the front view of your house
- a scaled drawing of a side view of your house
- include doors and windows in your scale drawings

Step 2: Calculating the cost of your house

You need to calculate the cost of your dream home. First, calculate the area in square meters of your foundation. Afterwards, decide whether you want a finished basement, unfinished basement, or crawl space. Calculate costs from the following rates.

Calculate the total area and cost of your foundation.

crawl space	$30 per square meter
unfinished basement	$60 per square meter
finished basement	$100 per square meter

Calculate the total area and cost of your floors.

carpeting	$10 per square meter
tiling	$15 per square meter
hardwood	$50 per square meter

Calculate the cost of the exterior of your dream home.

vinyl siding	$60 per square meter
log cabin	$70 per square meter
brick	$90 per square meter
stone	$130 per square meter

Calculate the cost of windows and doors

windows	$600 per window
exterior doors	$400 per door
interior doors	$200 per door

Calculate the cost of your roof

shingles	$10 per square meter
slate	$50 per square meter

Worksheet 2

Now that your scale drawing is completed, it is time to construct your model. The foundations of each house must be built out of cardboard. Once the initial structure has been erected, you must decorate the outside according to the type of house you have chosen to create:

Materials for Construction of Exterior of House

Vinyl Siding -	**Colored construction paper**
Brick -	**White construction paper with brick design**
Stone -	**White construction paper with stone design**
Log Cabin -	**Popsicle Sticks**

Don't forget to decorate the extra features on the outside of your house. For example: windows, doors, garage, etc. To receive extra credit, feel free to include yard features such as gardens, driveways, and the like.

Worksheet 3

We will be organizing your data in the form of lists using our TI-73 calculators. We will use these lists to create several graphs. All button names are in bold print as well as quotation marks. Follow along on the projector screen in the front of the class. If you run into problems, raise your hand.

We will be displaying the types of houses the class has created in a circle graph.

1.) Press the "**List**" button
2.) Move your arrow key over to the 7th list.
3.) Press "**2nd**", then "**Math**". You are now ready to input the name of your list.
4.) Spell out the word 'Houses' letter by letter.
5.) Move your cursor down to Done and press "**Enter**" twice. The word, Houses, should have appeared as the title for your list.

You are now ready to list the types of houses the class has created.

6.) Move cursor beneath 'Houses'. Press "**2nd**", then "**Math**".
7.) Remembering your quotations, insert the names of each type of building into your calculator. Press "**Enter**" twice after each one. The list of possible houses is on the board.
8.) Move your arrow key over to the 8th list.
9.) Press "**2nd**", then "**Math**". You are now ready to input the name of your list.
10.) Spell out the word 'Amt' letter by letter for amount. Repeat step 5.
11.) Input the amount of different houses into the list.

You are now ready to make a circle graph of your lists.

12.) Press "**2nd**", then "**Y=**"
13.) Press "**Enter**"
14.) Move your cursor to 'Plots On' and press "**Enter**"
15.) Move your cursor down to 'Type', then over to 'Pie Chart'
16.) Press "**Enter**"
17.) Move your cursor down to 'CategList'
18.) Press "**2nd**", then "**List**"
19.) Move your cursor down to 'Houses' and press "**Enter**"
20.) Move your cursor down to 'Data List'
21.) Press "**2nd**", then "**List**"
22.) Move your cursor down to 'Amt' and press "**Enter**"
23.) Move your cursor down and over to 'Percent' and press "**Enter**".
24.) Press "**Graph**" Your circle graph should appear on the screen.
What is the percent of each type of house created? What is the percent converted to a decimal? To a fraction?

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_____

_____

_____

We are now ready to graph the types of materials each student used.

25.) Press the "**List**" button
26.) Move your arrow key over to the 9th list.
27.) Press "**2nd**", then "**Math**." You are now ready to input the name of your list.
28.) Spell out the word 'Mat' letter by letter for the word 'Materials'.
29.) Move your cursor down to Done and press "**Enter**" twice. The word, Mat, should have appeared as the title for your list.

You are now ready to list the types of materials the class used .

30.) Move cursor beneath the word 'Mat'. Press "**2nd**", then "**Math**."
31.) Remembering your quotations, insert the names of each type of building material into your calculator. The list of possible materials is on the board.
32.) Move your arrow key over to the 10th list.
33.) Press "**2nd**", then "**Math**."
34.) Spell out the word 'Num' letter by letter for the word 'Numbers'. Press "**Enter**" twice. Move cursor beneath the word 'Num'
35.) Input the number of different building materials into the list.

You are now ready to create a pictograph of your lists.

36.) Press "**2nd**", then "**Y=**"
37.) Press "**Enter**"
38.) Move cursor to 'Plots On' and press "**Enter"**
39.) Move cursor down to 'Type' and 'Pictograph', then press "**Enter**"
40.) Move cursor down to CategList and press "**2nd**", then "**List**"
41.) Move cursor down to find 'Mat' and press "**Enter**"
42.) Move cursor down to Data List and press "**2nd**", then "**List**"
43.) Move cursor down to find 'Number' and press "**Enter**".
44.) Move cursor down to Scale and press "**5**"
45.) Move cursor down to 'Icon' to the Smiley Face and press "**Enter**"
46.) Press "**Graph**"

The pictograph of the data should have appeared on your screen.
What was the most popular type of material used?
Why do you think that most students chose that one?

_____
_____
_____
_____

Turn off calculator by pressing "**2nd**", then "**On**". Turn in calculator to your teacher.

Worksheet 4

Now that your house has been completed, it will be auctioned off to the highest bidder. In order for this to take place, you are required to write a sales advertisement describing your house in detailed mathematical terminology. This will enable a potential bidder to make an informed decision. Be sure to include such information as, square footage, number of rooms, area, perimeter, etc.

Do not forget to be creative. You want to receive the most money possible for your house, so make it sound like a beautiful place to live. Use plenty of descriptive adjectives!

Rubric for Scoring

Mathematical Content

3 Points -

- Student fully participated in each activity each day.
- Student demonstrated complete understanding of the following skills: addition, subtraction, multiplication, and division.
- Student performed accurate calculations using ratio and proportion as detailed in Worksheet 1.
- Student designed and constructed accurate scale drawings and models as detailed in Worksheet 2.
- Student displayed ability to graph activity results on the calculator as detailed in Worksheet 3.
- Student successfully made comparisons between real-life figures and activity calculations.

2 Points -

- Student participated in most of the activities.
- Student demonstrated some understanding of addition, subtraction, multiplication, and division.
- Student made only minimal errors in calculations using ratio and proportion as detailed in Worksheet 1.
- Student designed and constructed mostly accurate scale drawings and models as detailed in Worksheet 2.
- Student made minor errors in graphing results as detailed in Worksheet 3.
- Student made minor errors when making comparisons.

1 Point -

- Student minimally participated in the activities.
- Student showed limited understanding of addition, subtraction, multiplication, and division.
- Student made many errors in ratio and proportion calculations as detailed in Worksheet 1.
- Student's scale drawing and model were inaccurate as detailed in Worksheet 2.
- Student made many graphing errors as detailed in Worksheet 3.
- Student did not complete comparisons between activity results and real-life figures.

Rubric for Scoring

Language Arts Content

3 Points -

- Student fully participated in each activity each day.
- Student demonstrated complete understanding of the following skills: punctuation, capitalization, grammatical usage, and syntax.
- Student accurately completed Worksheet 4 with given requirements.
- Student displayed ability to use creative language to present their home in an attractive manner for the class auction.

2 Points -

- Student participated in most of the activities.
- Student demonstrated some understanding of punctuation, capitalization, grammatical usage, and syntax.
- Student completed Worksheet 4 with minimal errors.
- Student displayed moderate ability to use creative language to present their home in an attractive manner for the class auction.

1 Point -

- Student minimally participated in the activities.
- Student showed limited understanding of required grammatical knowledge.
- Student made many errors on Worksheet 4.
- Student displayed minimal ability to use creative language to present their home in an attractive manner for the class auction.